Part III – Responsiveness Summary

This Responsiveness Summary portion of the Record of Decision (ROD) presents the U.S. Environmental Protection Agency's (USEPA) responses to the written and significant oral comments received at the public meeting and during the public comment period. The section is divided into responses to written comments and responses to oral comments. Comments are expressed in italics, USEPA's responses in plain text.

Part III
Responsiveness Summary

Part III – Responsiveness Summary

This Responsiveness Summary portion of the Record of Decision (ROD) presents the U.S. Environmental Protection Agency's (EPA) responses to written comments received during the public comment period, as well as follow-up responses to oral comments received at the public meeting where such follow-up responses were determined helpful in providing additional detail. This section is divided into responses to written comments and responses to oral comments. Comments are expressed in italics, EPA's responses in plain text.

1 Responses to Written Comments

This section provides responses to written comments received by EPA during the public comment period. Written comments were received from two State of California agencies, the Technical Consultant representing the TAG recipients, and nine community members or interested parties.

1.1 Responses to Comments from Volkert and Debra Bernbeck, Community Members

1.1.1 February 17, 2004 Comments

Written Comment No. 1. *I agree with your preferred Alternative, I just have a couple of concerns:*

We have spent $150,000- for an elaborate garden with valuable shrubs and an arboretum of about 80 rare trees, now protected by a 9 feet high fence and gates against deer damage. If the washed down tailings will be removed, that portion of the fence and one gate will probably have to be removed. Will you pay for a temporary fence west of little clipper creek , to keep the deer out while the tailings are being removed and for the erection of a new fence and gate at the present location? (Allen Foles did the fence; he did a solid job and was very reasonable).

We don't have any plantings in the area of the tailings. The natural trees there however are very beautiful and we hope their bark will not be damaged.

EPA's Response. Any fencing that needs to be removed during the tailings excavation work will be either re-installed following construction or replaced with fencing of equal quality. Temporary fencing will be used as necessary during construction to keep property secured.

Written Comment No. 2. *I am sure you will take measures to reduce the dust as much as possible (water spray trucks etc).*

EPA's Response. Maintaining dust control will be a critical component of the soil excavation effort. EPA will require dust control measures and will monitor these measures during construction.

Written Comment No. 3. *What you have not mentioned in your paper is the mosquito problem in the summer caused by pools and puddles in the creek due to the washed down tailings. Between 2000 and 2003 I have improved this condition somewhat by cutting ditches to drain them and filling them with gravel. Hopefully this condition will be improved and not worsened by your projected work.*

EPA's Response. After removing the tailings, EPA intends to return the Little Clipper Creek channel to its natural condition, to the extent practicable. Ideally, this will result in a free-flowing channel. However, other man made features, such as the culverts beneath Tensy Lane, may be contributing to standing water. EPA will address this problem to the extent possible within the goals of the overall cleanup.

Written Comment No. 4. *In summary we are in full support of your " preferred Alternative".*

EPA's Response. EPA acknowledges the Bernbecks support for the preferred alternative..

1.1.2 February 29, 2004 Comments

Written Comment No. 1. *After our meeting we both agree with you that an application only for preferred Alternatives 2-3 and 3-4 of the Lava Cap Mine, without mentioning the clean-up of Lost Lake at this time, would have a greater chance to be approved. We are in favor of that.*

EPA's Response. EPA acknowledges the Bernbecks' comment in support EPA's approach. EPA is proceeding with the cleanup of the Mine Area Operable Unit (OU) at this time, extending down to Greenhorn Road. Lost Lake cleanup will occur as part of a subsequent Operable Unit.

1.2 Response to Comments from William J. Walker, Ph.D., Community Member/Potential Contractor

Written Comment No. 1. *I read with interest your latest Lava Cap Mine Newsletter and noticed that you will likely be considering a treatment plant for removal of As in surface water. Our firm, Walker & Associates, Inc in Sacramento has designed and constructed active and passive units for As removal in mine waters. I was the project coordinator for the testing and design of the system now being used at the Leviathan Mine. Obviously, we would like the opportunity to provide some information on our systems presently in use at several sites throughout the West, including 3 in California. Some of this in our website: www.walkergeochem.com. We would appreciate hearing from you at your convenience. You and I have had several conversations about other sites in the past and we believe we could make a significant impact on this site.*

EPA's Response. During the remedial design phase, EPA and its contractors will evaluate treatment technologies for removal of arsenic from surface water. This process is expected to start in late 2004. At that time, EPA will contact various firms, including Walker & Associates, to obtain technical details on potentially applicable treatment processes.

1.3 Response to Comments from Mr. Jerry Grant, Community Member

Written Comment No. 1. *We live on Lost Lake (800 feet of lakefront is our property line) so we are very interested in the toxic level in the lake. Please send the December surface water test results to me for lake and surrounding area. I know that 10 ppb of arsenic is the standard for drinking water. We are especially concerned for our dog who wades in and drinks out of the lake. Also do you not recommend that we put a boat in the water?*

EPA's Response. The requested arsenic results for Lost Lake have been provided to Mr. Grant separately. Although EPA is not aware of any specific toxicological data for dogs exposed to arsenic, we would not recommend that dogs be allowed to routinely drink water from Lost Lake. Also, if any dog spends time at Lost Lake, precautions should be taken to wash off any dust or soil, especially from the dog's feet, before it is allowed to enter the home.

The most significant human health concern at Lost Lake is repeated exposure (through ingestion and inhalation of tailings-impacted dust) to the arsenic-contaminated tailings and sediment present on the floor of the lake and along the shoreline, typically, extending 10 to 20 feet up from the lake. In general, EPA recommends that recreational use of the lake and surrounding shoreline be minimized and that precautions be taken to wash off any dust or soil, especially from hands and feet, after recreating in these areas.

1.4 Response to Comments from Mr. Robert S. Shoemaker, Community Member

Written Comment No. 1. *I preface my remarks by stating I am qualified to speak on this matter as I have had experience in research, design, construction and operation of 80 heap leaching and 40 conventional milling operations for the recovery of gold and silver from their ores and many other plants for the treatment and recovery of both ferrous and non ferrous metals. I am also acquainted with the contractor on the Lava Cap project and take pride that I was successful in convincing Mr. James Poirot to become a civil engineer instead of a carpenter which led him to become Chairman and CEO of CH2M Hill which was an outgrowth of the engineering firm of Cornell, Howland, Hayes and Merrifield.*

The EPA has studied the risks to both human and ecological health posed by the site and these efforts identified arsenic as the primary chemical of concern for human health at the site and arsenic and other metals as potentially harmful to plant and animal species. In special regard to animals the EPA gives a very long list of animals, birds and reptiles that live on the site and are apparently not affected by the arsenic. The mine is now over 140 years old and the EPA has not identified any human or animal that has been affected or become sick in any way by contact with the arsenic present.

EPA's Response. In evaluating risks to human and ecological health posed by any Superfund site, including the Lava Cap Mine Superfund Site, EPA uses criteria established through extensive scientific study of the impacts of contaminants on potential receptors. For example, extensive data exists to show that arsenic is a known human carcinogen. Site specific data for the Lava Cap Mine Superfund Site have been collected, and evaluated in Appendixes E and F of the Public Release Draft Remedial Investigation

(RI) Report (EPA, 2001) which present the full details of EPA's site-specific human heath and ecological risk assessments. As the risk assessments demonstrate, the levels of arsenic detected in various media at the Lava Cap Mine Site significantly exceed levels that have been documented to produce adverse health effects in human and ecological receptors.

Due to the lag time between exposure to a contaminant and the onset of health effects-- this is especially true for the mechanisms of carcinogenicity– it is not a true measure of potential health effects to obtain a snapshot in time of the health of local populations. The Superfund risk assessment process accesses existing wide-ranging health effects databases to evaluate the adverse impacts of contaminants on potentially exposed individuals. Detailed localized studies typically take many years to complete, are expensive, and are complicated by the numerous other factors that impact individuals' health. EPA's approach relies on accepted, proven scientific studies of contaminant toxicity, along with conservative assumptions of exposure, to assess potential risks posed by contamination .

Written Comment No. 2. *In addition the EPA has apparently not taken into consideration that the arsenic is present in both soluble and insoluble forms with the latter being arsenopyrite which is one of the most insoluble minerals existing and should not be considered hazardous. To use Total Arsenic only is deliberately misleading and highly unprofessional and does not permit a fair and unbiased assessment of the problems involved (if any).*

EPA's Response. During the data collection phase of this project, known as the Remedial Investigation, arsenic in soil and sediment was analyzed by methods SW6010 and SW6020. These methods require a digestion procedure prior to analysis. It is an aggressive procedure involving repeated additions of nitric acid and hydrogen peroxide, followed by addition of hydrochloric acid and refluxing. This procedure is expected to render the arsenic in the arsenopyrites into soluble form for detection by the analytical method, which results in a reading reported as total arsenic. Although these methods are aggressive, they do in fact mirror what takes place at a slower rate in nature. Although arsenopyrite is relatively insoluble, it will oxidize along with pyrite in the presence of water and oxygen. Oxidation of arsenopyrite will result in the release of arsenic into the environment.

Written Comment No. 3. *In addition, while the EPA recommends the installation of a treatment plant to lower the arsenic content of water issuing from the mine site, they do not state whether such a treatment plant is technically feasible and/or would be capable of lowering the contained arsenic to less than 10 parts per billion.*

EPA's Response. Given the available information on arsenic concentrations and mine area flow rates, coagulation/microfiltration was selected as the representative treatment technology for use in evaluating remedial alternatives based on cost-efficiency, proven effectiveness for arsenic removal to low concentrations, and lower volumes of process waste compared to other technologies.

During coagulation/microfiltration, ferric chloride (a metal salt) is added to the water to form hydrous metal oxides. The primary removal action for arsenic is co-precipitation, in which soluble arsenic species are incorporated into a growing insoluble metal hydroxide phase. After coagulation, hydrous ferric oxides, along with their sorbed arsenic load, can very effectively be removed from the water stream through microfiltration. Arsenic removal by co-precipitation with metal salts has been in use since at least the 1930s. Full-scale, pilot-scale, and bench-scale studies and applications have been performed for drinking water treatment.

A site-specific laboratory scale treatability study was conducted using water from the Lava Cap Mine adit to evaluate arsenic treatment with iron co-precipitation. In "jar tests" conducted at the laboratory, dissolved arsenic concentrations in water representative of the mine adit discharge were reduced from 320 µg/L to below 10 µg/L (which is the cleanup goal selected in this ROD) following addition of ferric chloride, flocculation, gravity settling, and filtration (Technical Memorandum re *Treatability Study Report, Lava Cap Mine Superfund Site*, CH2M HILL to EPA, April 5, 2002).

Written Comment No. 4. *The EPA has stated that the Lava Cap mine operated at various times from 1861 to 1943. All U.S. gold mines (including the Lava Cap) were closed by November 1942 by War Production Board Order No. L-208. I have not yet determined if it was re-opened after World War II.*

EPA's Response. The mine was not re-opened after World War II.

Written Comment No. 5. *The Lava Cap operated from its inception until the mid-1920's with gravity and amalgamation flowsheets and then converted to flotation concentration. The concentrate, which was sent to the Selby, CA smelter, was composed of gold and silver plus iron and arsenic sulfides and amounted to 20-22 tons per day. A cyanide plant was added to the Lava Cap flowsheet in October, 1940 and treated the flotation concentrate for gold and silver recovery. At that time the cyanide tailings which contained the arsenic and iron sulfides were sent to the tailings pond instead of the smelter. Any cyanide compounds left at the site after plant closure would have decomposed within a short time of plant closure and therefore cyanide does not represent a hazard.*

EPA's Response. EPA does not believe the facts support the claim that any cyanide compounds present after closure would have decomposed within a short time. Decomposition rates would depend on the characteristics and location of the cyanide wastes. Isolated samples from the source areas taken during the data collection phase of this project did contain elevated concentrations of cyanide. Nevertheless, EPA agrees that cyanide is not a significant contaminant of concern at the site.

Written Comment No. 6. *I would appreciate hearing from you as to why the EPA believes this site is hazardous since there never has been (and thus never will be) people or wildlife harmed by the arsenic on the site.*

EPA's Response. The health effects of arsenic on the human population are well documented. EPA strongly believes that based on the extensive scientific studies conducted on the health effects of exposure to elevated levels of arsenic, there is a strong possibility of negative impact to human health and the environment from levels of arsenic and other metals detected in data collection efforts at the Lava Cap Mine Superfund Site.

1.5 Response to Comments from James and Joan Dyer, Community Members

Written Comment No. 1. *We are writing this letter in support of proceeding with the proposed cleanup of the Lava Cap Mine area operable unit. At the February 26th meeting, we, as well as all of the families living in the affected area, supported alternative 3-4. We hope to see this plan implemented, as discussed at the meeting.*

EPA's Response. EPA acknowledges the Dyer's comment in support of Alternative 3-4.

Written Comment No. 2. *A number of people living downstream of Greenhorn Road and at Lost Lake expressed a preference for delaying any action until an overall plan for the total clean can be made. They expressed a fear that the clean up would end after the first phase was completed. This is a concern that needs to be addressed in a timely manner. A road map that lays out the several phases of the clean up would be a good first step.*

EPA's Response. The main body of this Record of Decision (ROD) describes how the proposed cleanup at the Mine Area Operable Unit is the first step in the overall plan for cleanup at the Lava Cap Mine site. The ROD also specifically states that it is EPA's intention to continue with the ongoing Superfund study and cleanup process for the Lost Lake Area.

Written Comment No. 3. *Clean up activities downstream of Greenhorn Road seem, to us, to represent a more challenging set of activities; they will require more community involvement. If this approach is chosen, with the road map, more support for proceeding could be generated.*

Early in the study, the dam at Lost Lake was identified as requiring replacement. The reason sighted was the danger of collapse. Expressing the need to do this, as well as other specifics, would show a definite commitment to the project.

Again, we look forward to your proceeding with the first phase next spring.

EPA's Response. EPA concurs that cleanup in the Lost Lake area presents several additional challenges, including the need to fully evaluate Lost Lake Dam. EPA also acknowledges the need for further community involvement in decision-making at that part of the site. EPA has cited this as one of the key factors in favor of separating the site into separate OUs, so that the cleanup at the Mine Area can proceed while cleanup alternatives are under development for the Lost Lake area.

Although EPA is not at the stage where specific components of a proposed cleanup plan in the Lost Lake area can be presented, replacement or rehabilitation of Lost Lake Dam is an alternative that must be seriously considered.

1.6 Response to Comments from Mary Devincenzi, Community Member

Voicemail Comment No. 1. *Called to say that she lives on Hoppy Hollow Road and that the residents recently (Fall 2003) had Hoppy Hollow resurfaced at a cost of $2-3,000 per home. She expressed concern that when the Lost Lake portion of the cleanup begins, if Hoppy Hollow is used as an access road, the resurfacing work will be undone through the damage of truck traffic associated with the cleanup. She inquired who would be liable for any such damage.*

EPA's Response. EPA has not yet developed the cleanup alternatives for the Lost Lake portion of the site, including identification of access routes. However, EPA will include the costs of road restoration in any cleanup proposal that will directly impact the identified access roads. Once EPA selects a preferred cleanup plan for the Lost Lake area, another Proposed Plan fact sheet will be distributed and a public meeting held. The likely access routes will be described at that time.

1.7 Response to Comments from Robert Parvin, Community Member

Voicemail Comment No. 1. *Called to say although he could not attend the Feb 26 public meeting, he was subsequently given information from others who did attend, and that EPA's proposal seems as good as any. Other than that he had no particular comments but did inquire about the status of the investigation/cleanup south of Greenhorn Road.*

EPA's Response. EPA acknowledges Mr. Parvin's comment in support of EPA's cleanup proposal. EPA is in the process of developing cleanup alternatives for the area downstream of Greenhorn Road. There are a number of additional challenges involved with developing a potential cleanup plan for the Lost Lake area. EPA is committed to completing the technical evaluations in the near term.

1.8 Response to Comments from Michael M. Miller, Community Member

Written Comment No. 1a. *It was reported that water samples are taken quarterly in various locations at the site. Written data provided at the meeting failed to provide adequate facts to justify the existence of harmful effect from the levels of arsenic or other elements or conditions of the water.*

EPA's Response. EPA's presentation did cover in general terms the risks associated with the levels of contamination found at the Mine Area Operable Unit in soil, surface water, sediment, and groundwater used as drinking water. In November 2001 EPA presented in a more extensive manner its findings regarding risks to human health and the environment, at a public meeting held in Grass Valley. EPA has concluded, based on a process of evaluation common to all Superfund sites, that the Lava Cap Mine Superfund Site poses unacceptable risks to human health and the environment. In evaluating risks to human and ecological health, EPA uses criteria established through extensive scientific study of the impacts of contaminants on potential receptors. This process is part of the Administrative Record for this Site and is explained in detail in Appendixes E and F of the Public Release Draft RI Report (EPA, 2001).

Written Comment No. 1b. *Staff reported no excessive levels in any wells or drinking water.*

EPA's Response. Although specific information on arsenic levels in groundwater was not discussed at the public meeting, elevated arsenic levels have been detected in residential wells at and downgradient of the mine and in monitoring wells located beneath the tailings/waste rock at the mine. It should be noted that groundwater contamination at the Lava Cap Mine Site will be addressed in a subsequent ROD.

Written Comment No. 1c. *Is there any evidence of damaged plants due to harmful arsenic or other natural minerals?*

EPA's Response. Terrestrial plant samples were collected and analyzed from several areas of the site. Arsenic concentrations in samples from tailings-impacted areas were much higher than those detected in reference areas. These data were used to evaluate risks to various species that eat those plants. Site-

specific biological surveys comparing plant communities in impacted areas to reference areas have not been conducted.

Written Comment No. 1d. *Consultant failed to adequately explain the existence of, the relationship of, the testing protocol of or the significance of the different arsenic compounds (As3 and As5). An explanation is necessary to properly evaluate the level of harm both potential and proven.*

EPA's Response. One round of arsenic speciation analyses was completed at selected locations at the mine, including five monitoring wells, two residential wells, and the adit discharge. The results varied considerably. Arsenic III was dominant (at least 80% of the total arsenic) in four monitoring wells and one residential well, while Arsenic V was dominant (at least 74% of the total arsenic) in one monitoring well, one residential well and the adit discharge. Most of the studies pertaining to the human health impacts of arsenic are reported in terms of total arsenic, thus EPA believes its data collection efforts at the site have been appropriate.

Written Comment No. 2. *The flow rates of Little Clipper Creek and Clipper Creek are presented unclearly. Standardize the use of "gpm" or "cfs" so comparisons and relevance can be readily compared. What is the evidence that increased levels of arsenic or other minerals from the discharge are denigrating the quality of life in the creeks?*

EPA's Response. For reference, one cubic foot per second (cfs) is equivalent to approximately 450 gallons per minute (gpm). In this Record of Decision the terminology has been standardized in terms of cubic feet per second.

Visual evidence that the quality of life in the creeks has been affected has been limited to certain storm events, including the 1997 event that resulted in the partial failure of the log dam at the Mine Area Operable Unit. The California Department of Fish and Game conducted an inspection of Little Clipper Creek following that event and concluded that tailings from the mine had significantly impacted and degraded fish and wildlife resource values; they further concluded that tailings deposits in the stream bed have the consistency of fine talc, that the material plumes easily and remains in suspension for prolonged periods, and that such material is hazardous to most aquatic species utilizing gills. At that time, the Department of Fish and Game concluded that Little Clipper Creek had lost its assemblage of macroinvertebrate populations.

Sampling conducted by EPA under its Superfund investigation has demonstrated that arsenic levels in fish and other aquatic organisms are elevated. Benthic communities appear to have recovered somewhat since 1997, as EPA's measurement of the benthic invertebrate community downgradient of the mine and in reference areas using Rapid Bioassessment Protocol developed by the California Department of Fish and Game suggested there were no clear differences between reference and downgradient benthic invertebrates. One rationale for securing the tailings in place as selected by this Record of Decision is the potential for further releases of tailings of the nature of those from 1997, which based on past experience would create short term impacts to fish and wildlife as well as the long term impacts that are suggested by the elevated levels of arsenic detected in the tissue of fish and other aquatic organisms.

Written Comment No. 3. *Staff represented that the great storm of the winter of 1997-98 was a hundred year storm. Perhaps, but unlikely because the storms twenty miles north of the site experienced a 500 year rated storm. Which is true? Planning for a 100 year storm or a 500 year storm requires different scenarios for protecting the waterways. Explain the differences required for construction.*

EPA's Response. EPA believes this question refers to statements made in the public meeting that initially the return frequency of the storm that damaged the log dam in 1997 was thought to be on the order of one hundred years. Statements were also made in the public meeting that subsequent analysis showed the return frequency to be much less. Based on further analysis, EPA has estimated the return frequency at approximately twenty-five years. This reflects a peak flow of 120 cubic feet per second at the log dam. This analysis is presented on page 1-17 of the Feasibility Study (EPA, 2004).

In the Feasibility Study, the conceptual design of channels to be constructed to route storm flows around the tailings impoundment is based on the return flow from a 100-year storm. A 100-year return flow is typically used for channel design. The Little Clipper Creek diversion channel is designed for the 100-year return flow of 200 cfs. In contrast, the 500-year return flow for Little Clipper Creek at the log dam is estimated at 290 cfs, which is 90 cfs greater than the 100-year return flow. For a 500-year event, a Little Clipper Creek flow of 290 cfs would result in minimal increase to the size of the channel. Based on the same channel cross-section used for the 100-year flow, increases of less than 0.5 feet in channel depth and 1.0 feet per second (fps) in velocity were calculated.

Written Comment No. 4. *Concerns were raised about unhealthy conditions for people, pets and plants. What evidence do you have that planting eatable vegetables in this type of soil is harmful? Are there any studies or scientific proof that mineral dust including as or other trace minerals have caused death. Injury or sickness in conditions identical to those at the site?*

EPA's Response. Uptake of metals by plants and vegetables varies depending on many factors but is widely known to occur. EPA's statements suggesting vegetables should not be planted in contaminated areas of the Mine Area Operable Unit are qualitative and cautionary rather than quantitative in nature. The exposure which drives the risk to human health from arsenic is the incidental ingestion of arsenic in various media. The detailed risk evaluation is available in the Human Health and Ecological Risk Assessments included in the Public Release Draft RI Report (EPA, 2001), in which can be found detailed discussions regarding the estimated risks associated with exposure to the contaminated media present at the Lava Cap Mine Site. The risk assessments include numerous references to the scientific studies that support the various assumptions and toxicological data used in developing the risk estimates.

Written Comment No. 5. *What physical damages have occurred between 1979, when the log dam gave way and 1997 when tailings were spread downstream?*

EPA's Response. For clarification, the partial log dam collapse occurred in January 1997. In 1979, State authorities investigated a smaller release of tailings into the Little Clipper Creek drainage. The partial collapse of the dam in 1997 resulted in widespread distribution of tailings throughout the downstream areas. The California Department of Fish and Game conducted an inspection of Little Clipper Creek following that event and concluded that tailings from the mine had significantly impacted and degraded fish and wildlife resource values

Written Comment No. 6. *What plans or studies are there regarding the historical structures and artifacts at the site? Are the federal, state and county archeological laws, standards and rules being followed to protect the historic assets of the site?*

EPA's Response. The Lava Cap Mine site has not been designated as having historic value to warrant inclusion in the National Register of Historic Places. However, the age of the mine buildings requires consideration of the National Historic Preservation Act (NHPA) and list of state registries. Under the

preferred alternative (Alternative 2-3) excavation of highly contaminated soils and hazard abatement (e.g., removal of cyanide vats and sumps) would be conducted in and around the mine buildings. However, the mine buildings would not be demolished or destroyed. As discussed in Section 5 of the Feasibility Study, if any significant cultural, historical, archaeological, or ecological resources are identified during site activities or construction activities, applicable or relevant and appropriate requirements would govern the actions. In Appendix D, the Feasibility Study identifies the National Historic Preservation Act (NHPA), National Historic Landmarks Program, National Register of Historic Places, Archaeological and Historic Preservation Act, and Archaeological Resources Protection Act of 1976 as potentially applicable requirements.

Written Comment No. 7. *Has an EIR or EIS been completed? Will the project qualify for a Negative Declaration instead? Who has prepared and evaluated the environmental potential harm from removing the minerals from the eco-system now living on the land? What evidence is there of environmental damage to plant or aquatic life since 1997?*

EPA's Response. Superfund cleanups are exempt from the NEPA and CEQA process under which an EIR or EIS would be prepared and Negative Declaration determinations made. The scope of EPA's Superfund investigations is as rigorous as, if not more rigorous than, the NEPA and CEQA processes, as is its public involvement component.

There have been numerous scientific studies on the impacts of arsenic on human and ecological receptors. The Human Health and Ecological Risk Assessments included in the Public Release Draft RI Report (EPA, 2001) document the significant potential risks to ecological and human receptors associated with the elevated arsenic concentrations present in the contaminated surface water. EPA believes the evidence concludes treating the contaminated mine discharge to remove high levels of arsenic will be beneficial, not detrimental, to the ecosystem.

Although there are areas at the site with distressed plant and aquatic habitat, it is difficult to separate out how much of this damage has occurred since 1997. Contaminated tailings and surface water were present in these areas well before the partial collapse of the log dam in 1997.

Written Comment No. 8. *Who has evaluated the economic benefit to the public at large from the estimated costs of the project?*

EPA's Response. EPA evaluates the overall potential threat to human health and the environment represented by a site during the initial listing process that is used to place sites on the National Priority List (NPL). The very fact that a site is listed means a determination has been made that the site warrants additional investigation. As part of the Remedial Investigation process, EPA evaluates the extent of contamination and assesses potential risks to various receptors at the site. If EPA determines that the potential risks exceed those considered acceptable as defined in the NCP, cleanup alternatives are evaluated in the Feasibility Study. Cost is one of the criteria EPA uses to compare alternatives in the FS and select a remedy. If the costs of a particular cleanup option are high compared to the protectiveness provided, depending on its relative ranking in other categories, that alternative will likely end up ranked lower than other alternatives.

Written Comment No. 9. *Under Site Risks on page 5, what scientific evidence supports the conclusion that "arsenic presents the primary risk to human and ecological health at the site?*

EPA's Response. The human health and ecological risk assessments prepared for the site (presented in the RI Report [EPA, 2001]) were prepared in accordance with accepted risk assessment protocols and rely on extensive scientific research into exposure pathways, toxicity, and potential risks to various receptors resulting from exposure to contaminated media. These documents conclude that the Mine Area Operable Unit poses an unacceptable risk to human health and the environment.

Written Comment No. 10. *Based on the site specific data available at this time, none of the alternatives are in the public's best interest and do not meet the statutory requirements of CERCLA, par.121(b). A pure scientific approach to the mine site will more likely benefit the public than the current rhetoric about mineral rich water. Arsenic is an abundant naturally occurring mineral with proven benefits to the environment. Its removal from the waterways flowing through the site may cause environmental degradation downstream and this aspect of the issue has not been addressed. The study is incomplete.*

EPA's Response. EPA respectfully disagrees. EPA has studied the Mine Area Operable Unit to a scientific degree which fully supports the selection of a cleanup option. Although arsenic is a naturally occurring constituent, numerous scientific studies have documented that elevated concentrations of arsenic cause significant harm to ecological and human receptors. Regardless, it is not technically feasible to completely removed arsenic from the surface water bodies at the Mine Area Operable Unit. EPA's goal is to reduce arsenic concentrations to below accepted regulatory and health-based criteria. The lowest practicable level of treatment would be to background levels, or levels or arsenic found in other streams in the area; even treatment to such levels would not result in environmental degradation downstream of the mine, rather the opposite would be true.

Written Comment No. 11. *What options are currently available to local people who may want to eliminate minerals from their drinking water? What are the benefits to the public if people with even the potential for mineral content in their drinking water treat the water at the faucet? Has this alternative received a study? If so, publish the results. If not, why?*

EPA's Response. There are numerous ways to reduce minerals in drinking water, but generally the most commercially available product is the water softening unit. In water softening, the mineral ions in drinking water are exchanged with other ions, commonly sodium. While water softening can reduce such constituents as calcium and iron, it is not effective on arsenic. To remove arsenic, reverse osmosis technology is most readily employed, and there are commercially available treatment units capable of treating a single household tap, or the home's entire water supply. EPA recommends that individuals considering employing one of these technologies consult a licensed plumber or water treatment vendor to evaluate their options. Treating water at the faucet can help reduce exposure to harmful contaminants like arsenic, from which most of the risk of exposure is through ingestion, however it does not completely eliminate risk since some exposure does occur through showering.

EPA acknowledges the extensive use of individual water supply wells in the area of the Lava Cap Mine OU. It should be noted that the remedy selected in this ROD does not address groundwater contamination. However, EPA is continuing to study groundwater conditions at the site as part of a separate RI/FS. If groundwater contamination is determined to be migrating away from the mine and impacting drinking water resources, EPA will need to more fully evaluate ways of protecting individual water supply wells and will be in a better position to advise local residents at that time. As part of a response action taken at the Mine Area Operable Unit in 2003, EPA installed in-home treatment units in three homes where elevated arsenic concentrations were detected in residential wells.

1.9 Response to Comments from Will Doleman, Community Member

1.9.1 Comments from Mr. Doleman's March 23, 2004 Letter

Written Comment No. 1. *At a meeting Grass Valley, February 26, 2004 representatives from the Environmental Protection Agency (EPA) discussed their proposal to clean up the Lava Cap toxic waste area from the Lava Cap mine to Greenhorn Road. As I stated to (EPA's) David Seter, I feel that including an outline of the entire project with a proposed schedule showing the time-lines for the action segments and the approvals would be an important addition to the proposal for the following reasons:*

If we do a partial cleanup, this could lower our clean-up priority. Since EPA has limited funds, projects in other areas could eat up their money, and they could not get back to us.

EPA's Response. EPA acknowledges Mr. Doleman's concern but would like to reassure the public that our intention is to clean up the entire Lava Cap Mine Superfund Site, not just the Mine Area Operable Unit. The approach being taken at this Site is similar to that taken at other Superfund sites, where cleanup work is conducted in phases, recognizing that when sufficient information is collected to support cleanup of one portion of the site, work on that portion of the site is not delayed pending completion of all site studies. EPA's belief is that the overall cleanup moves quicker, not slower, using this approach.

This ROD selects the cleanup for the Mine Area Operable Unit. The term "Operable Unit" is used to define a discrete action that is an incremental step toward a comprehensive site remedy. Operable units typically address specific geographic areas at the site, or specific media, or a specific phase of a cleanup. In addition to the remedy selected in this ROD for the Mine Area Operable Unit, EPA continues to work on two other components of the site; the Lost Lake Operable Unit; and the Groundwater Operable Unit. EPA will identify and evaluate cleanup alternatives for these two other portions of the site and present them to the public in the same manner as has occurred for the Mine Area Operable Unit. Although funding for Superfund cleanups is subject to a federal budgetary decision making process, EPA does not believe that implementing this first portion of the remedy at the Mine Area Operable Unit will reduce the likelihood of funding for the remainder of the site.

Written Comment No. 2. *While only four homes occupy the mining property, 30 or 40 more surround Lost Lake where the majority of arsenic tailings washed down when the Mine's log dam broke in 1996. The Federal Geological Survey team reported that the tailing sediments are over 40'deep in the deepest part of Lost Lake near the dam. The proposal made at the meeting does not include any part of Lost Lake, or Clipper Creek and Little Greenhorn Creek which are a short distance downstream from the Lake.*

EPA's Response. Although the remedy selected in this ROD only addresses the Mine Area Operable Unit, EPA acknowledges that contamination from the mine has impacted a number of properties surrounding Lost Lake and the other downstream surface water drainages. As was stated at the public meeting, EPA believes that the source areas at the mine need to be contained first to ensure that further releases do not impact downstream areas. Concurrent with the design of the Mine Area Operable Unit cleanup selected in this ROD, EPA will be working on the Feasibility Study of cleanup options the

downstream areas, including Lost Lake. Once that Feasibility Study, EPA will propose one or more cleanup alternatives intended to address impacted areas downstream of the mine.

Written Comment No. 3. *The proposal also does not deal with ground water downgrade from the Mine, nor does it address the contaminated water table in the mine itself. (The EPA reported that the adit had the highest levels or arsenic found.) I believe that in this area the EPA proposal is deficient. The mine itself and its presence in very permeable lava geologic strata poses significant risks of contaminating wells downstream. Many well drilling reports confirm that lava water bearing strata is common to Nevada County. I think that an assumption is being made that underground streams flow in the same direction as Clipper Creek. However, because of the ancient lava geologic formation, the flows could take numerous different routes. A geological survey of the flow paths from the mine should be performed, or a tracer could be added to the mine water in indicate the direction of the flow.*

EPA's Response. EPA agrees that there are potentially significant groundwater concerns at the Lava Cap Mine Superfund Site. Groundwater at the Lava Cap Mine Site is currently being investigated by EPA as part of the Groundwater Operable Unit investigation. After the investigation is complete, EPA will evaluate various cleanup alternatives and present a separate plan to the public that specifically addresses groundwater. Nevertheless, EPA believes the cleanup selected in this ROD will reduce the potential for groundwater contamination by reducing the infiltration of rainwater and surface flows into the mine tailings through the construction of an impermeable cap over the tailings and by re-routing clean surface water flows around the tailings and into Little Clipper Creek below the mine.

Written Comment No. 4. *To compound this problem, the proposed Idaho-Maryland mine, which is below, and southwest of the Lava Cap mine is dewatering its shafts. The negative pressure could draw flow from the Lava Cap mine. Yet neighborhood wells directly between the two mines are not being tested. Another portion of this proposed mine is near Brunswick and Idaho-Maryland roads, west of Lava Cap. These wells too, are not being tested. In springs downgrade from the Lava Cap mine we have found gelatinous material, similar to that at the base of Lost Lake. This gelatinous material contains high levels of arsenates.*

EPA's Response. As is noted in the preceding response, EPA is currently investigating groundwater conditions at the Lava Cap Mine Site. As part of this study, EPA will collect regional groundwater data, ranging farther afield than the immediate mine area, to better understand groundwater flow directions and rates in areas downgradient of the mine. EPA may also expand its current well sampling program, which so far does extend south to Lost Lake, if deemed necessary. EPA does not believe the facts bear out a connection between the Lava Cap Mine and the Idaho-Maryland Mine, however, our groundwater investigation will be sufficiently detailed to uncover such a connection should it exist.

Written Comment No. 5. *As the neighborhood monitor and water researcher I invite Mr. Seter, Mr. Towell, the California Dept of Health, as well as the region IX hydrologist to join me on a tour of these areas. If we can observe the larger picture we can do the most good with our Tax Dollars cleaning up the harmful contaminants.*

Once again, we in the Greenhorn Road area appreciate your offer to clean up the mine area. It is just that we feel that what has been proposed is premature. Please join us on this tour se we can show you things about our neighborhood that might have a bearing on the cleanup of the Lava Cap mine.

EPA's Response. EPA appreciates the offer for a tour of the local area. EPA does not agree that it is premature to propose and select a remedy for the Mine Area Operable Unit. EPA believes the approach it is taking is the most efficient and cost effective, and will result in a construction start which will secure the tailings held behind the damaged log dam at the Mine Area Operable Unit at the earliest practicable date.

1.9.1 Handwritten Comments Attached to Mr. Doleman's March 23, 2004 Letter

Handwritten Comment No. 1. *In 1934 there were a couple of residential wells in the minter area. Not the case today.*

EPA's Response. EPA takes note of Mr. Doleman's comment. Overall there has been a substantial increase in the number of residential wells in the mine vicinity, particularly over the last 20 to 30 years. Groundwater conditions at and downgradient of the Lava Cap Mine Operable Unit are currently being evaluated by EPA. After the investigation is compete, a separate Feasibility Study and ROD will be prepared to address groundwater concerns.

Handwritten Comment No. 2. *Theocyanide (sic) and some forms of bacteria can carry arcinate (sic), aluminum and lead into the air. This could be why screening samples are high.*

EPA's Response. As EPA understands the comment, the screening samples referred to are soil samples which were collected in the Deposition Area above Lost Lake and around the Lost Lake perimeter. EPA believes the facts show the elevated arsenic concentrations in these samples are the result of direct deposition of tailings during releases from the mine, including the 1997 log dam failure.

Handwritten Comment No. 3. *Since the area is also comprised of sulfur-sulfides, iron and nitrogen, much of this cyanide may have compounded into theocyanide (sic), a substance we know little about.*

EPA's Response. Although the laboratory analyses conducted on soil samples during the RI would not have detected thiocyanate, it should be noted that the EPA Region 9 screening criteria (known as the preliminary remediation goal) for this compound is relatively high. The higher the screening level, the lower the toxicity, because human beings can tolerate greater amounts of the substance. For purposes of comparison, the industrial preliminary remediation goal for thiocyanate in soil is approximately 100,000 mg/kg whereas the similarly defined goal for arsenic is 1.6 mg/kg for arsenic. Furthermore, given the limited detections of cyanide at the site, it is highly unlikely that thiocyanate is present at concentrations that are of health concern.

Handwritten Comment No. 4. *These samples will be taken in Spring '04 as the EPA test area has already been expanded to incorporate areas near Little Greenhorn Road area.*

EPA's Response. As EPA understand the comment it refers to statements in the Remedial Investigation Report (EPA, 2001a) regarding the collection of additional samples downstream in Little Greenhorn Creek. The purpose of collecting these samples was to better delineate the downstream extent of tailings originating at the Lava Cap Mine. EPA expects to collect additional samples in this area in future as part of the Feasibility Study currently being conducted for the Lost Lake Operable Unit.

Handwritten Comment No. 5. *Chemicals which hide the arsenic are being used to move the arsenic to the waters surface so that they are not being detected or to a simisolid (sic) grey or orange sludge to the waterways substraight..*

EPA's Response. EPA is not aware that any chemicals have been introduced into surface water features at or downstream of the mine which would conceal arsenic or move the arsenic to the water surface. EPA recalls that Mr. Doleman has previously made similar comments at which time EPA expressed an interest in receiving any evidence that could be provided by Mr. Doleman or other individuals but to date no such evidence has been provided to EPA. The possibility that arsenic is somehow being concealed is also discounted by the fact that arsenic has been detected in nearly all of the samples collected in surface water bodies downstream of the mine. EPA acknowledges that arsenic concentrations in Lost Lake vary seasonally, but we believe the facts support the conclusion that this is a natural phenomenon, with levels generally spiking upward in the late summer/fall when there is less flux through the lake and when the water is in contact with the tailings-impacted sediment for a longer time.

Handwritten Comment No. 6. *Iron+sulfur+nitrogen+cyanide= theocyanide (sic). Is this being tested for.*

EPA's Response. During the RI field investigation, soil, sediment, surface water, and groundwater were analyzed for total cyanide by the distillation procedure SW9010. The method for total cyanide measures only free cyanide and cyanide complexes that can be dissociated into cyanide ions under the conditions of the acid distillation procedure that is carried out prior to the analysis. Thiocyanates are not broken down by this distillation procedure, and therefore are not measured by this analytical method. However, as is noted above, EPA believes the facts support the conclusion that thiocyanate is not likely to be present at levels considered a threat to human health.

Handwritten Comment No. 7. *Are wells in the <u>above orientation from</u> the mine, Lost Lake Deposition Area and Lost Lake being tested?*

EPA's Response. As EPA understands the comment it refers to the orientation (north-northwest) and dip (51 degrees to the east) of the inactive reverse faults where the gold-bearing quartz veins occur. Some residential and monitoring wells located north/northwest of the mine have been tested by EPA. With respect to wells in the deposition and Lost Lake areas, EPA's current monitoring program does include wells located in these areas. When investigation of the Groundwater operable Unit is complete, EPA will be in a better position to more thoroughly describe the behavior of local and regional groundwater systems.

Handwritten Comment No. 8. *Ok, your well report from your title company or get a copy from the County, which might indicate like many wells here that your water origanate (sic) from lava rock geological formation. Some well drillers were lax and did not list well water source.*

EPA's Response. As EPA understands the comment it refers to text in the RI Report Executive Summary stating that fractured metasedimentary bedrock is the source of domestic water throughout the Site vicinity. To the extent that the comment may imply that knowing the source of water (i.e., lava versus sedimentary bedrock) for an individual's domestic well may help determine if the well will be impacted by arsenic, EPA would like to note that naturally occurring levels of arsenic have been detected in groundwater monitoring wells that are completed in both the overlying volcanic ("lava") formation and in the underlying metasedimentary bedrock formation where the mine workings are located.

1.10 Response to Comments from G. Fred Lee, PhD, Technical Advisor to SYRCL (the TAG Recipient)

Note: For reference, the full text of Dr. Lee's comments is included as an attachment to this Responsiveness Summary, as it includes material that does not specifically comment on EPA's proposed cleanup plan. The following text excerpted from Dr. Lee's full text contains the comments which Dr. Lee submitted related to EPA's proposed remedy and the associated technical evaluations presented in the FS.

Written Comment No. 1 (page 2, 2nd full paragraph). *Based on my professional experience and expertise, I find that the US EPA's proposed approach for remediation of the Mine Area Operable Unit is appropriate. With high-quality construction, the proposed remediation approach for the mine area will greatly reduce the near-term threat that the tailings and contaminated soils in the mine area and along Little Clipper Creek upstream of Greenhorn Road represents to public health and the environment. Basically, the US EPA has adopted an approach of an acceptable least-cost remediation of the immediate threat caused by the tailings and runoff waters, where the long-term costs associated with maintaining the capped tailings and contaminated soils and treatment of mine discharges and runoff waters will have to be paid by future generations.*

EPA's Response. EPA takes note of Dr. Lee's finding that its approach is acceptable. EPA will continue to work with Dr. Lee and other stakeholders to ensure that the design and construction of the remedy are of acceptable quality and meet the needs of the local community.

Written Comment No. 2. ***(Page 3, paragraph 1 and the beginning of paragraph 2):*** *The US EPA has selected 10 µg/L as the arsenic cleanup objective for contaminated waters at the Lava Cap Mine Superfund site. This value is the same as the US EPA drinking water maximum contaminant level (MCL) for arsenic in domestic water supplies. The US EPA Lava Cap Mine Superfund site staff have characterized this cleanup objective as "protective" without discussing the degree of protection provided. In my previous discussion of the appropriateness of using this value as a cleanup objective, I have characterized this value as a politically based MCL. This value is not a risk-based value but was selected to reduce the cost of water treatment to remove arsenic from drinking water for small domestic water supplies.*

Adopting this value at the Lava Cap Mine Superfund site as the water arsenic cleanup objective is not in accord with the Central Valley Regional Water Quality Control Board approach for establishing water cleanup objectives for waste-derived pollutants. At other Superfund sites background or a true risk-based value is used as the cleanup objective for waste-derived pollutants.

EPA's Response. EPA respectfully disagrees that its adoption of the arsenic MCL as the cleanup objective for water is not in accord with the Central Valley Regional Water Quality Control Board approach for establishing cleanup objectives. The Regional Board takes several factors into account in establishing cleanup objectives. Regulatory limits such as MCLs are often selected as limits for discharge of treated water. Depending on many factors including cost and feasibility, the Regional Board may or may not attempt to use background levels for setting cleanup objectives or discharge standards. EPA believes its evaluation of the factors typically considered by the Regional Board support the establishment of a cleanup objective based on the MCL. The Regional Board's comments on the

proposed cleanup plan (see Section 1.11 below) do not reject EPA's selection of the federal arsenic MCL as the cleanup goal.

Written Comment No. 3 (Page 3, last paragraph). *Using the 10 µg/L as a cleanup objective at the Lava Cap Mine Superfund site will be protective since the arsenic derived from the mine and the tailings will be diluted by low-arsenic water before the runoff from the area will be consumed as drinking water on a regular basis. It will be important that no one establish an individual water supply based on surface waters of Little Clipper Creek, Clipper Creek, or Little Greenhorn Creek.*

EPA's Response. EPA takes note of Dr. Lee's conclusion that using 10 µg/L as a cleanup objective for arsenic will be protective. EPA would like to reiterate that none of the drainages immediately downstream of the mine are currently used as drinking water sources.

Written Comment No. 4 (Page 4, first paragraph). *The 20 mg/kg for soil and the 25 mg/kg for sediments selected by the US EPA as cleanup objectives for tailings-contaminated soils and sediments is in accord with typical Superfund soil and sediment cleanup objectives. These values are protective of human health for those who have occasional contact with the soil or sediment. They are also expected to be protective of wildlife.*

EPA's Response. EPA takes note of Dr. Lee's finding that cleanup to the stated background levels will be protective of human health and wildlife.

Written Comment No. 5 (Page 4, paragraphs 2 through 4). *The US EPA, in its February 26, 2004, summary of the mine area remediation approaches, has a category called "Long-Term Effectiveness." However, no information is provided on what the US EPA staff who developed the evaluation of the effectiveness of the various approaches considered for the mine area remediation with the plastic sheeting cover liner meant by Long-Term Effectiveness. The only true term of reference for long-term effectiveness should be for as long as the wastes that are left at the site are a threat. This is the regulatory requirement for landfilling of wastes in California. The proposed approach of capping the tailings and contaminated soils with a plastic sheeting cover liner is known to be effective for a short term compared to the length of time that the waste tailings and polluted soils placed under the plastic sheeting will be a threat.*

The US EPA has indicated that the plastic sheeting covered tailings pile will be "Very Effective" and "Would provide long term treatment of mine discharges and tailing seeps and long term containment of mine tailings." The Feasibility Study (FS) document states on page 5-27, "Based on the performance of existing landfill liner and cover materials, it is estimated that little or no deterioration of the HDPE membrane would occur for a period in excess of 200 years." No citation is given for this statement. At the February 26, 2004, pubic hearing, D. Seter, in response to a question from the audience, stated that he understood that the liner manufacturers claim that the liner will last 100 years. I pointed out that the liner manufacturers warrant an HDPE landfill liner for only 20 years. Further, this warranty is based on the landfill owner removing the wastes over the point in the liner where there is deterioration. Basically this warranty is of no value.

Based on my over 20 years of work on landfill liner performance, I know of no valid support for the hundreds of years period of time for the expected performance of the plastic sheeting liner in the tailings pile cover to keep water out of the tailings pile. There is considerable unreliable information on the projected performance of HDPE liners in landfills. They are based on unreliable application of the

Arrhenius equation. The actual performance of the plastic sheeting layer in the tailings cover could readily be much shorter than that projected by the US EPA consultants (CH2M Hill, 2004).

EPA's Response. Estimates of the lifetime of landfill liners were obtained from the EPA Office of Research and Development document *Assessment and Recommendations for Optimal Performance of Waste Containment Systems* (EPA/600/R-02/099, December 2002). The principal investigator for the geosynthetic tasks was Dr. Robert M. Koerner of Drexel University/GRI. According to this reference accelerated laboratory evaluations were performed to predict the lifetime of HDPE geomembranes.

The lifetime of a geomembrane was evaluated in three stages: antioxidant depletion, induction time, and half-life of engineering properties. Antioxidants neutralize oxygen diffusing into the polymer structure, and thereby inhibit oxidation from occurring. Once antioxidants are depleted, the induction time begins. The induction time is described as the time that it takes an unstabilized polymer (i.e., one with no antioxidants) to begin oxidative degradation. In the third stage, the oxidation continues and the engineering properties begin to change as the liner transitions from a ductile to brittle material. A 50% change in properties was used in the evaluation to signify the end of service life of the material.

As part of the evaluation, incubations were performed in the laboratory at elevated temperatures, and samples were periodically tested for changes in properties. Dr. Lee is correct that the Arrhenius equation was then used to predict the lifetime of antioxidants in the HDPE geomembranes and the half-life of engineering properties. Under simulated landfill conditions, the lifetime for the antioxidant depletion was estimated as 200 years, the induction time was estimated as 20 years, and the half-life of engineering properties was estimated as 750 years, for a total lifetime estimate of 970 years.

Written Comment No. 6 (Page 5, first full paragraph). *One of the major deficiencies of the US EPA final document that discusses the various approaches for the remediation of the mine area is the failure to reliably discuss the consequences of the eventual failure of the plastic sheeting liner in the cover to prevent moisture from entering the landfill that would leach arsenic that can pollute groundwater under and down groundwater gradient from the capped tailings area.*

EPA's Response. As is noted in the previous response, the expected lifetime of the liner is on the order of 100s of years. However, EPA does expect to include periodic direct visual monitoring of the HDPE geomembrane cap as part of the long-term maintenance program for the site. Although only a small segment of the liner would be viewed, this monitoring should help detect accelerated degradation of the liner.

In addition to the HDPE geomembrane, a vegetated soil cover, containment of the adit discharge, surface water diversions and tailings pile grading to reduce ponding are additional components of the remedy that will reduce future surface water infiltration into the tailings. Plus, long-term seepage from the tailings pile will continue to be collected at the toe of the buttress.

Once the remedy has been in place for several years, any significant increase in the seepage rate would serve as an indicator of increased infiltration and potential liner problems.

Written Comment No. 7 (Page 5, 2nd full paragraph). *Independent of how long the plastic sheeting layer in the cover is an effective barrier to water entering the tailings pile, there is no doubt that it will eventually fail to prevent large amounts of water from entering the tailings pile. The tailings in the tailings pile will be a threat to pollute groundwaters forever. A question that has not been addressed is*

how this failure will be detected. Since the plastic sheeting layer is buried under two feet of soil, it cannot be visually inspected for points of deterioration. Leak detectable covers are available that could indicate when the tailings pile plastic sheeting layer fails to prevent water from entering the tailings pile. However, this type of cover is typically not used because of the additional expense of operating and maintaining the system and the eventual cost of having to replace the cover when the leak detection system indicates that the low-permeability layer in the cover has failed to keep moisture out of the tailings pile.

EPA's Response. As is noted in the previous response, the liner is only one of the remedy components being used to reduce the potential for water to enter the tailings pile. The vegetated cover and tailings pile grading will reduce the potential for surface infiltration into the tailings pile. In addition, all surface water flow in the tailings pile vicinity (including the adit, Little Clipper Creek, other minor drainages, and infiltration routes through the waste rock) will be re-routed and controlled, eliminating this major source of tailings pile recharge. These engineering controls will be key in greatly reducing the flux of water into the tailings pile, without even considering the role of the liner, which is to resist the already reduced surface water flows.

Routine inspections of the tailings pile on a long-term basis will provide evidence of physical disturbance (e.g., excavation or digging) that could puncture or otherwise damage the cover system. A program of excavating test seams under the protective cover soil could be performed to evaluate the liner condition at regular intervals. Electrical leak location surveys have been used on other projects to locate very small breaks in the plastic sheeting. With proper design of the cover system, tears in the membrane should be as rare as deterioration of the plastic itself. In addition, seepage from the tailings pile will be collected at the toe of the buttress, further reducing the potential for long-term groundwater impacts. Significant increases in the volume of seepage over time would be an indication of large amounts of water entering the tailings pile due to degradation of the impermeable cover.

EPA is investigating groundwater contamination as part of a separate operable unit. The Groundwater Operable Unit RI/FS will propose long-term groundwater monitoring to evaluate the effectiveness of the various remedial actions implemented at the site. This will include groundwater monitoring wells located downgradient of the tailings pile to detect future impacts to groundwater.

Written Comment No. 8 (Page 5, 4th full paragraph, 3rd sentence). *Of particular concern is the comparison of leaving the waste (tailings) at the site versus offsite disposal at a properly sited, designed, constructed, monitored and maintained disposal site. Fifty years is a very small part of the time that monitoring and maintenance funds will be needed to be devoted to the Lava Cap Mine tailings pile. If, in fact, the true cost of remediation were calculated, the onsite tailings pile would prove to be the most expensive.*

EPA's Response. EPA respectfully disagrees with the comment. We believe that, if anything, actual operation and maintenance costs related to capping the tailings in place will be lower than estimated. Specifically, EPA chose the high end of the range of potential water treatment costs by assuming the largest possible flow and the more costly conventional treatment technology. EPA expects that flow reductions and the potential for incorporating innovative treatment technologies will result in reduced costs. Furthermore, since EPA will be in control of the design and construction of the cap-in-place alternative, we will have greater assurance that the containment goals will be met. What must be considered is that any offsite disposal facility would also require monitoring and maintenance, and that some offsite facilities that were previously considered to have been properly sited, designed, constructed,

monitored and maintained have later been shown to have caused impacts to the surrounding environment. EPA does acknowledge that there is uncertainty in attempting to estimate project costs over a period of decades or centuries. This is part of the reason EPA selects a specific time frame for costing, then compares remedial alternatives using a present worth cost estimate.

Written Comment No. 9 (Page 5, 4th full paragraph, 6th sentence). *The difference is that the costs to the US EPA are less with the plastic sheeting covered tailings pile. The primary costs of this remediation will have to be borne by the state of California and the people within the sphere of influence of the Lava Cap Mine Superfund site.*

EPA's Response. EPA would like to point out that cost is only one of the factors considered in the selection of a cleanup alternative. For example, offsite disposal is considered borderline unimplementable due to the predicted resistance of any receiving community to which the waste would be sent, and the resistance of communities through which the waste would be shipped. EPA has selected the cap-in-place alternative because we believe it is protective of human health and the environment, presents the best balance between short term and long term protectiveness, and is cost-effective. EPA believes the greatest component of operations and maintenance costs will be related to water treatment, not cover maintenance, and we are taking steps to minimize contaminated surface water flows and test less costly innovative treatment methods. EPA acknowledges that the State of California will be responsible for assuming long term operations and maintenance costs.

Written Comment No. 10 (Page 6, 1st partial paragraph, 2nd sentence). *DTSC should explicitly state its obligation for ad infinitum high-quality Lava Cap Mine Superfund site mine area monitoring and maintenance for as long as the wastes tailings and contaminated soils left at the site under a plastic sheeting liner and cover will be a threat. Specific information should be provided by DTSC on the resources that it will commit to this responsibility. Also, DTSC should indicate how it will keep the local stakeholders informed about the results of the monitoring and maintenance at the site.*

EPA's Response. EPA acknowledges that EPA and the State of California must reach agreement on a State Superfund Contract, which specifies EPA and State responsibilities for the site, including financial obligations. However, it should be noted that EPA retains responsibility for ensuring that the cleanup remains protective of human health and the environment. After the remedy construction has been completed and the treatment facilities are determined to be operational and functional, the primary mechanism EPA will use to ensure the Site remains protective is the Five-Year Review process. As long as wastes are left on-site or treatment is ongoing, EPA is under a statutory requirement to review the status of the site at least every five years. This process includes obtaining input from regulators and local stakeholders and results in preparation of a report that documents the review and is released to the public.

Written Comment No. 11 (Page 6, 1st full paragraph, last sentence). *While it appears that the US EPA Region 9, which is responsible for the Lava Cap Mine Superfund site, has thus far been conducting its five-year reviews, there are significant questions about whether this Region will be funded to carry out future five-year reviews for as long as the wastes in the covered tailings pile will be a threat.*

EPA's Response. While EPA acknowledges Dr. Lee's concern, we would like to express our commitment to conducting five-year reviews at all sites where wastes remain on site, in accordance with the Superfund statute.

Written Comment No. 12 (Page 6, 2nd full paragraph, last sentence). *It is inappropriate to think that some yet undiscovered technology will likely evolve to significantly reduce the costs of tailings pile remediation.*

EPA's Response. EPA duly notes Dr. Lee's comment, however we would like to clarify the intention of our comments regarding emerging technologies made during the Proposed Plan Public Meeting held in February 2004. We were primarily trying to convey the concept that the selected remedy is not frozen in time upon completion of construction. As part of the Five Year Review process, various ways of improving system performance and reducing cost are considered. System optimization, under which existing processes are fine-tuned, is one particular component of the review process. Emerging technologies are also considered as potential additions to or replacements of existing technologies, although as Dr. Lee points out, their development is generally longer rather than shorter term in nature. Nevertheless, EPA remains convinced that, particularly in the area of water treatment technology, advancements may be made which will assist the cleanup of the Lava Cap Mine Superfund Site in future.

Written Comment No. 13 (Page 7, 1st partial paragraph, last two sentences). *At this time the US EPA has only provided the public with a general outline of the US EPA "preferred alternative" approach for remediation of the mine area. The public should be given the opportunity to review the details of the ROD, caucus among stakeholders and then express their views on the acceptability of the remediation approach for the mine area.*

EPA's Response. EPA respectfully disagrees with Dr. Lee. The Proposed Plan fact sheet distributed in advance of the public meeting held February 26, 2004, described all components of the remedy and referred the reader to the Public Release Draft Feasibility Study for additional details. The components of the remedy were discussed during the public meeting. The Feasibility Study, which was previously reviewed and commented upon by Dr. Lee in his role as technical advisor to the community under the EPA-funded Technical Assistance Grant program, contains an appropriate level of detail to thoroughly understand the remedy. Following the public meeting, during the thirty day public comment period, stakeholders had the opportunity to caucus, members of the public had the opportunity to meet with each other and with their technical advisor, and all interested individuals and parties had the opportunity to express their views on the acceptability of EPA's proposed remedy. EPA intends to continue its efforts to keep Dr. Lee and the community informed, and to provide the opportunity for public input, throughout the steps to follow of remedy design and construction.

1.11 Response to Comments from Robert Busby/ California Regional Water Quality Control Board (RWQCB), Central Valley Region

Written Comment No. 1. *Has EPA assessed the relative effectiveness of the potential remedies for OU-1 on reducing the flux of arsenic and other mine related constituents into underlying groundwater which will be addressed during implementation of the selected remedy for OU-2? Shallow groundwater beneath the waste rock/tailings pile has been impacted as described in the Remedial Investigation Report. The mine tailings and waste rock over the bedrock reportedly contain shallow saturated zones with elevated concentrations of arsenic. However, groundwater flow paths are not well known because of the fractured nature of the aquifer and the paucity of data currently available. Therefore, the relative efficacy of the potential remedies for OU-1 to reduce arsenic loading to underlying groundwater should*

be an essential criterion in the decision making process. Closing the waste rock and tailings as a waste pile as proposed in Alternative 2-3 may not prevent impacts to perched or shallow groundwater if the proposed surface water diversions do not effectively reduce groundwater recharge and significantly lower groundwater levels. In contrast, an onsite lined disposal cell will more likely effectively contain the arsenic and other mine related constituents and be more protective of shallow underlying groundwater. Long term cost savings might then be realized in the implementation of a remedy for OU-2.

EPA's Response. Using the data collected and field observations made during the Remedial Investigation and Feasibility Study, EPA has carefully evaluated the relative potential effectiveness of the alternatives at controlling long-term impacts to groundwater. It would appear that creating an onsite lined disposal cell (as contemplated in Alternative 2-5) would result in a greater reduction in the short term to the ongoing threat the currently uncovered tailings pose to groundwater. However, EPA believes that Alternative 2-3, when properly constructed, operated, maintained and monitored, will achieve similar long-term reductions in the potential flux of contaminants to groundwater.

In designing and implementing the selected remedy, EPA will take all steps necessary to stop further influx of surface water and precipitation into the tailings pile. In addition, a series of horizontal drain pipes will be included in the lower end of the tailings pile, above the buttress. These drains will help to collect any free liquid moving down through the tailings pile. After the several years of operation, the amount of free liquids remaining in the tailings pile is expected to be minimal. EPA also plans to install shallow groundwater monitoring wells to help detect any future releases from the tailings pile. The amount of liquid produced from the buttress drain system will serve as a measure of the reduction of the influx of surface water and precipitation into the tailings pile.

Written Comment No. 2. *We concur with EPA's proposal to implement the selected alternative in phases, as appropriate. For example, alternative 2-3 would be conducted in phases to evaluate the effectiveness of surface water controls before designing and constructing a surface water treatment plant. Currently there is a significant level of uncertainty on the influence of an adjacent ephemeral stream on mine portal discharge rates. The mine portal is partially covered with waste rock and colluvium which also receive runoff from the stream. This area should be well characterized prior to designing and constructing a surface water treatment plant. Furthermore, the effectiveness of the proposed surface water diversions to direct flow away from the mine inlets and from the consolidated waste pile should be directly evaluated and adjustments should be made in a phased approach as necessary.*

EPA's Response. EPA acknowledges RWQCB's support for the proposed phased approach and concurs with the importance of thoroughly understanding conditions at the mine portal (or adit). EPA intends to continue to gather data on surface water flow during design of the selected remedy, as well as after the completion of construction of the low-permeability cover and surface water diversions.

Written Comment No. 3. *The proposed preliminary remediation goal for surface water is set at the federal Maximum Contaminant Level (MCL) for arsenic of 10 micrograms per liter (µg/l). What are the technological and economic impacts of treating to background surface water arsenic concentrations which are reportedly less than 1 µg/l ?*

EPA's Response. EPA has calculated the background concentration of total arsenic in surface water at 1.8 micrograms per liter, which is a level five times lower than the federal Maximum Contaminant Level.

The feasibility of treating surface water down to this level has been demonstrated by bench-scale treatability tests conducted by CH2M HILL's Applied Science Laboratory which have indicated reduction of arsenic concentrations to below 2 µg/L is feasible using ferric chloride co-precipitation under laboratory conditions. These results are reported in the technical memorandum *Treatability Study Report, Lava Cap Mine Superfund Site* submitted by CH2M HILL to EPA in April 2002. However, it must be pointed out that field applications often encounter different conditions than those found in the laboratory and that ferric chloride co-precipitation has not yet been used to reduce arsenic concentrations below the MCL in a pilot or full-scale operation at the Lava Cap Mine Site. Additional testing would be required to determine the long-term effectiveness and reliability of treating to background concentrations. Furthermore, treatment of mine discharge to background concentrations rather than the MCL of 10 µg/L would have negative operational and economic impacts. Greater ferric chloride dosages would be required, resulting in increased long-term chemical costs, greater sludge production, and increased sludge disposal costs. In addition, a polishing step may be required following coagulation/microfiltration, resulting in increased capital and operation and maintenance costs.

Written Comment No. 4. *The design plans for the proposed buttress will need to address dynamic failure and the potential for liquifaction of the tailings behind the buttress.*

EPA's Response. EPA concurs with RWQCB's comment that the proposed buttress will need to be designed to be stable under dynamic (i.e., seismic) conditions with consideration of the potential for liquefaction of sediments. The current conceptual design presented in the FS was based on achieving internal and external stability under static and pseudo-static conditions. The California Seismic Hazard Map published by CalTrans in 1996 was used to determine site seismicity and the maximum peak horizontal ground acceleration. The map uses the anticipated Maximum Credible Earthquake from young faults in and near California to define the safety evaluation event for design. The Maximum Credible Earthquake is defined as the largest earthquake which can be expected to occur on a fault in the current tectonic regime..

1.12 Response to Comments from Steven Ross/ California Department of Toxic Substances Control

DTSC separated their comments into Section I, containing comments on the Proposed Plan (Comments No. 1 through 13) and Section II, containing comments on the Supporting Feasibility Study (Comments No. 14 through 28). DTSC previously commented on a Draft version of the FS in October 2003 and, at that time, did not raise the issues now included as comments 14 through 28.

Proposed Plan Comment No. 1a. *DTSC agrees with EPA's view that water treatment options be evaluated after the effectiveness of any surface water controls and containment option is examined. Before proposing a water treatment system for the State to cost share, EPA should examine in greater detail the design, operation and maintenance costs for the system. Possibly a pilot system treatment study can be installed and operated to determine the necessary parameters for operating a full scale system.*

EPA's Response. EPA acknowledges DTSC's comment in support of phased implementation. EPA plans to perform additional evaluation of treatment options after determining with greater certainty the volumetric flow rate of surface water requiring treatment. This flow rate will be better defined through

additional data collection efforts. Installation of a pilot-scale treatment unit based on innovative or conventional technologies is being considered and EPA will further discuss this option with DTSC.

Proposed Plan Comment No. 1b. *Operation of a full scale high capacity volume coagulation/ microfiltration water treatment system may be costly and likely to produce a large volume of sludge requiring its handling. Any sludge produced may fail the STLC test increasing the disposal costs from a Class II to a Class I disposal facility.*

EPA's Response. Based on the most current information available at the time of the development of the Feasibility Study, EPA concluded it is most likely that the sludge would be disposed of as an industrial non-hazardous waste in a Class II offsite disposal facility. EPA agrees that leaching analyses, such as TCLP or STLC testing, may need to be performed to determine the actual hazardous waste classification of residual sludge. The assumption of Class II disposal is based on a full-scale design CH2M HILL is conducting for a water treatment plant of similar capacity. As an example of the generally non hazardous nature of sludge from ferric chloride co-precipitation, the sludge from the Pogo Mine adit treatment system (Delta Junction, Alaska) meets TCLP and does not require disposal as a hazardous waste.

The EPA guidance *Technologies and Costs for Removal of Arsenic from Drinking Water* (EPA 815-R-00-028, December 2000) characterizes the ability of arsenic removal technologies to meet regulatory standards and estimates costs for treatment technologies. The guidance describes residual characteristics for both coagulation/filtration and coagulation assisted microfiltration treatment processes. For coagulation assisted microfiltration, the technology considered in the Lava Cap Mine Area FS, the guidance references tests conducted by Clifford (D. A. Clifford, G. Ghurye et al., December 1997, *Phases 1 & 2 City of Albuquerque Arsenic Study Field Studies on Arsenic Removal in Albuquerque, New Mexico using the University of Houston/EPA Mobile Drinking Water Treatment Research Facility*) and the University of Colorado (*Arsenic Treatability Options and Evaluation of Residuals Management Issues,* American Water Works Association Research Foundation [AWWARF], April 1998) that indicate sludge from this treatment process will pass the TCLP test for arsenic toxicity by a considerable margin, making it unlikely that hazardous waste disposal will be necessary.

For coagulation/filtration, several studies are mentioned in the guidance document. Tests conducted by the University of Colorado indicate that most coagulation/filtration sludges will pass the TCLP test (AWWARF, 1998). A study by Battelle, (EPA, June 2000, *Arsenic Removal from Drinking Water by Coagulation/Filtration and Lime Softening Plants*), examined the characteristics of the waste sludges generated by two coagulation/filtration plants (Plant A and Plant B). The sludge from Plant A was generated from backwashing anthracite coal/pea gravel filters, while that from Plant B was generated as a result of sedimentation in primary and secondary clarifiers and from filter backwashing. Both sludges passed the TCLP test for arsenic toxicity by a substantial margin. However, the sludge from Plant A would violate the soluble threshold limit concentrations (STLCs) established by California for arsenic and copper.

Disposal of residuals is largely dependent upon influent arsenic concentrations, coagulant dose, and solids content. As mentioned previously, TCLP and STLC testing would need to be performed to characterize sludge for the Lava Cap Mine site.

Proposed Plan Comment No. 2. *DTSC accepts Alternative 1-4, excavation around residences. In addition, the northern residence may require remediation although cost estimates in the feasibility study*

do not account for this. One soil sample collected approximately 100 feet from the residence measured 59 mg/kg corresponds to risk and hazard above levels of human health concern.

EPA's Response. EPA acknowledges DTSC's acceptance of the selected Alternative 1-4 and concurs that remediation may be required around the northern residence. The Feasibility Study assumed two residences based on information available at the time and for cost estimating purposes. The need for remediation around the northern residence will be determined during remedial design.

Proposed Plan Comment No. 3. *DTSC accepts Alternative 3-4, excavation of contaminated sediments in Little Clipper Creek and consolidation for disposal.*

EPA's Response. EPA acknowledges DTSC's acceptance of the selected Alternative 3-4

Proposed Plan Comment No. 4. *Alternative 2-3 is acceptable to DTSC. However, EPA should attempt to mitigate disadvantages and shortcomings of this alternative when compared to Alternative 2-5. If Alternative 2-3 is selected, DTSC's position is that a 10 year cost share is appropriate. Disadvantages in selecting Alternative 2-3 in lieu of Alternative 2-5 follow.*

EPA's Response. EPA acknowledges DTSC's acceptance of the selected Alternative 2-3. As part of the remedial design process, EPA will work closely with DTSC to ensure that the design of the selected remedy is acceptable to DTSC.

Proposed Plan Comment No. 4i. *The capping component of Alternative 2-3 will not have a liner underneath the tailings which may continue to leach arsenic tainted water through fractures and joints in the bedrock. This appears possible given the saturated nature of the tailings.*

EPA's Response. EPA acknowledges that during the initial period of remedy implementation, the water currently entrained in the tailings pile will continue to represent a threat to the underlying shallow groundwater. However the influx of precipitation and surface water flows into the tailings pile will be immediately reduced upon completion of the low-permeability cover and surface water diversion structures. In designing and implementing the selected remedy, EPA will take all steps necessary to stop further influx of surface water and precipitation into the tailings pile. In addition, a series of horizontal drain pipes is included in the lower end of the tailings pile, above the buttress. These drains will help to collect any free liquid moving down through the tailings pile. After the several years of operation, the amount of free liquids remaining in the tailings pile is expected to be minimal, greatly reducing the long-term threat to groundwater. EPA also plans to install shallow groundwater monitoring wells to help detect any future releases from the tailings pile.

Proposed Plan Comment No. 4ii. *Upon completing the groundwater investigation in a separate Operable Unit, optimum locations for placing groundwater extraction wells may be on top of the engineered cap.*

EPA's Response. EPA acknowledges that it may not be possible to accommodate all of the optimal monitoring well placement locations following construction of the low-permeability cover. Accordingly, EPA will evaluate alternatives such as moving the monitoring wells downgradient or installing angled or horizontal wells from outside of the capped area. Although it is not preferred, if necessary, wells can still be installed through the cap by undertaking additional protective measures..

Proposed Plan Comment No. 4iii. *The buttress is an additional design structure which would require future maintenance yet this engineered structure is not necessary in Alternative 2-5.*

EPA's Response. EPA acknowledges that a buttress would not be required under Alternative 2-5. However, EPA believes that the buttress is a fairly low maintenance structure. Alternative 2-5 would require other monitoring and maintenance considerations that a buttress would not require.

Proposed Plan Comment No. 4iv. *The cap will likely require long-term treatment of seeps as long as the tailings remain in place resulting in additional operation and maintenance costs placed on the State compared to the disposal cell option in Alternative 2-5. Alternative 2-5 ensures tailings will be excavated, dried, consolidated and encapsulated between upper and lower liners guaranteeing its isolation. Alternative 2-5 removes the tailings to a location up gradient of source areas and away from the saturated subsurface materials. Over time, leachate from the disposal cell may diminish lowering the State's operation and maintenance costs.*

EPA's Response. Although EPA concurs that leaving the tailings in-place results in more water to be treated initially, over the long-term EPA anticipates a significant reduction in the volume of water seeping out of the tailings pile, such that there is little net difference in long-term O&M costs between the two options.

Proposed Plan Comment No. 4v. *EPA's assessment of short-term risk posed by potential exposure to arsenic identified as a limitation in implementing Alternative 2-5 is not supported. Worker safety will follow OSHA standards and residents have been removed from source areas. EPA does not detail the short-term exposure from saturated arsenic tailings anticipated by workers and whether extraordinary safety measures are necessary in implementing Alternative 2-5 over Alternative 2-3.*

EPA's Response. Although it is expected that workers will wear appropriate health and safety gear, EPA still believes that the relocation of the large volume of highly-contaminated, very fine-grained material does represent an increased short-term (i.e., construction) risk. In addition, the drying, relocation, and disposal of the tailings in the landfill increases the potential for further spreading of contamination through airborne transport.

Proposed Plan Comment No. 4vi. *EPA indicates Alternative 2-5 has increased short term risk and engineering challenges compared to Alternative 2-3 as a result of extensive handling and drying of saturated tailings. However, the operation and maintenance requirements would be reduced, comply with water quality objectives, and may prove more effective and permanent than the capping component of Alternative 2-3.*

EPA's Response. EPA respectfully disagrees with DTSC that the landfilling alternative results in reduced O&M requirements. Over the long-term, EPA expects that Alternative 2-3 will meet water quality objectives.

Proposed Plan Comment No. 5. *DTSC agrees that arsenic is the major risk driver. However, several other metals (aluminum, antimony, chromium (as Cr+6), iron, lead, manganese, and nickel) are present at the Lava Cap Mine Site in concentrations corresponding to estimated potential risks greater than 1 x 10-6 or hazards greater than 1.0 based on calculations employing DTSC recommended assumptions. These metals were in concentrations predicted to yield potentially significant risks to humans. The concentrations of aluminum, manganese, and nickel are only predicted to have potential to adversely*

affect short term workers (construction workers). Lead was present in mine source areas at concentrations up to 2320 mg/kg soil. An agreeable approach would include analysis of all these constituents during confirmation sampling with comparison to established cleanup goals in the Record of Decision and/or remedial action plans.

EPA's Response. EPA is planning to conduct post-cleanup confirmation sampling for more than just arsenic. Samples will likely be analyzed for the full suite of metals. EPA will continue to work with DTSC on developing acceptable methods for determining when the cleanup actions are complete. EPA has proposed using the reference *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites/EPA 540-R-01-003/September 2002* (EPA, 2002a) as the technical basis for conducting confirmation sampling, and based on preliminary discussions held between EPA, DTSC, and RWQCB, in June 2004, believes that this approach is an acceptable one.

Proposed Plan Comment No. 6. *In EPA's October 5, 2001 Responses to Dr. Lee, a data gap was acknowledged at the mine area with respect to potential contamination by organic chemicals. Describe how this data gap will be addressed during remediation and confirmation sampling and/or discuss how this data gap was resolved.*

EPA's Response. Samples were collected and analyzed for organic constituents from several of the most contaminated water and soil locations in the mine area during the 2001 data gaps sampling effort. The results of this sampling are included in the *Field Monitoring Report for Remedial Investigation/ Feasibility Study Field Activities - August through November 2001, Lava Cap Mine Superfund Site*, dated April 2002. The water samples were all non-detect for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). One of the soil samples contained low levels of four SVOCs (three phenols and one phthalate). These results indicate that significant organic contamination is not likely a concern in the mine area.

Proposed Plan Comment No. 7. *DTSC recommends using an estimate of the central tendency such as the arithmetic mean or the 95th percent upper confidence limit (UCL) on the arithmetic mean (95th UCL), not the 95th percentile, for background data sets of samples.*

Consequently, DTSC advises employing the 95th UCL on the arithmetic mean as background concentrations of metals in surface soil (n=18), and the mean concentrations of metals in sediments (n=13). DTSC recommended background concentrations for soil, sediment, and surface water for arsenic are provided in the "DTSC Summary Table".

EPA's Response. Calculation of background concentrations for use as screening levels in the FS followed the framework set forth by the Human and Ecological Risk Division of DTSC in the *Final Policy of Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Facilities and Permitted Facilities* (February 1997). The guidance states that when few data are available to describe background conditions (i.e., n<20), both the shape of the background distribution and its upper extremes are uncertain, and the value representative of ambient conditions should be a measure of central tendency, such as the arithmetic mean or an upper confidence interval around the mean. When ambient conditions are well described (i.e., sample sizes are larger and the distribution is well defined), an estimate of an upper percentile of the ambient distribution, such as the upper 95th or 99th percentile, may be used.

In following DTSC's guidance document, EPA did use an estimate of central tendency (the 95th percent UCL of the mean) where appropriate to develop background concentrations. The lower value of either the 95th percent UCL of the mean or maximum detect was used for subsurface soil, sediment, filtered surface water samples, filtered groundwater samples, and unfiltered groundwater samples. These data sets contain 13 or less data points each. EPA disagrees with DTSC's proposal to use the mean instead of the 95th UCL of the mean to estimate the background concentrations for sediment. The mean, or arithmetic average, is a more conservative estimate of central tendency, and data points within the background concentration distribution would be characterized as being indicative of contamination. Specifically, arsenic concentrations in 3 of 13 data points in the sediment background data set are between the mean (20 mg/kg) and the 95th UCL of the mean (25 mg/kg).

The surface soil data set originally contained 20 data points; two were identified as outliers and not included in the development of background concentrations. These samples were not thought to be representative of background conditions. The resulting data set for arsenic in surface soil has 18 data points (all of which are detections) and little scatter. Given that the sample numbers approached DTSC's threshold and, following the removal of outliers, the data set contained little scatter, an estimate of the upper 95th percentile was used rather than an estimate of central tendency. Arsenic concentrations in 6 of 18 data points in the surface soil background data set are between the 95th UCL of the mean (14 mg/kg) and the 95th percentile (20 mg/kg).

During the remedial action, the data set of confirmation samples will be compared to the reference area data set to determine whether the site has been cleaned to background conditions, rather than comparing an individual confirmation soil sample result to a singular cleanup goal. This will be accomplished using parametric tests (e.g., t-test) or nonparametric tests (e.g., Wilcoxon Rank Sum) to identify whether the data sets are statistically different. EPA will work with DTSC to develop the specific approach to be used in determining when the cleanup is complete. EPA has proposed using the reference *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* as the technical basis for conducting confirmation sampling, and in preliminary discussions held between EPA, DTSC, and RWQCB, in June 2004, believes that this approach is an acceptable one.

Proposed Plan Comment No. 8. *As the human health risk assessment contains several divergences from DTSC guidance, with some of the most notable being the lack of inclusion of inhalation and dermal pathways and use of exposure assumptions and toxicity criteria that underestimate risk as compared to DTSC recommended assumptions, DTSC would like EPA to consider using the values in the attached tables for establishing cleanup goals in the Record of Decision.*

EPA's Response. As is noted at the end of the previous response, EPA proposes to rely more on comparisons of the confirmation soil sample results to the reference area data sets for determining when cleanup is complete, rather than on comparison to a single background level of risk-based cleanup goal. EPA will work with DTSC to develop the specifics of this approach.

Proposed Plan Comment No. 9. *The proposed plan indicates natural background concentrations of arsenic at about 20 mg/kg for soil, 25 mg/kg from sediment, and 1.8 ug/l surface water. Using the methodology for determining background as discussed in an earlier comment, DTSC calculates the arsenic background values as 14 mg/kg (95% UCL, n=18) for soil and 20 mg/kg (mean, n=13) for sediment. DTSC agrees with the 1.8 ug/l value as representative of background in surface water.*

EPA's Response. See the detailed response to DTSC Comment No. 7 regarding calculation of background concentrations.

Proposed Plan Comment No. 10. *As per the EPA Region 9 PRGs Table, the acceptable risk range of 10-4 to 10-6 for arsenic is represented by 39 to 0.39 ppm arsenic in residential soil. However, because 22 ppm represents a non-cancer hazard index of 1.0, DTSC recommends that any acceptable soil concentration be below 22 ppm. How much below can be determined by local background conditions. At the Lava Cap Mine Superfund Site, DTSC recommended background arsenic concentrations are 14 mg/kg soil and 20 mg/kg sediment.*

EPA's Response. See the detailed response to DTSC Comment No. 7 regarding calculation of background concentrations. EPA believes that the background concentrations presented in the FS (20 mg/kg for surface soil and 25 mg/kg for sediment) are accurate and appropriate representations of background for the Lava Cap Mine area.

Proposed Plan Comment No. 11. *DTSC has completed review of the equations and assumptions applied in the cleanup goal (CUG) spreadsheets transmitted by CH2M Hill and placed into tables in Appendix G of the Feasibility Study. Based on this review, DTSC has developed and attached spreadsheets applying DTSC recommended assumptions and generated proposed CUGs for soil, sediment and surface water for the mine OU consistent with DTSC guidance. DTSC would like EPA to consider these recommended assumptions and CUGs. These assumptions and/or development of CUGs are as follows:*

i. Lead human health risk-based cleanup goals are derived by employing DTSC's Blood Lead spreadsheet Version 7.0 using the 99th percentile blood lead concentration of 10 ug/l as the point of departure for protection of human health.

ii. DTSC has developed and attached assumptions and generated recommended CUGs for soil/sediments for the following scenarios:

- *a. Outdoor Worker*
- *b. Short-term (Construction) Worker*
- *c. Resident*
- *d. Recreationalist I (includes infants through adults)*
- *e. Recreationalist II (includes school age children through adults)*

iii. DTSC has developed and attached recommended human health risk-based CUGs for surface water exposures by recreational users applying the Recreationalist I and II scenarios. DTSC assumed no swimming in or fish ingestion from Little Clipper Creek.

iv. DTSC recommended toxicity criteria used in development of the CUGs include inhalation RfD for arsenic, cadmium, cyanide and nickel, as well as oral RfD for cadmium.

v. In the absence of route-specific non-carcinogenic toxicity criteria, DTSC recommends using surrogate toxicity criteria obtained by route to route extrapolation. If heavy metals with published inhalation and oral toxicity criteria are examined, the data show significant more toxicity via the inhalation route. This suggests that assuming inhalation toxicity is equivalent to oral toxicity yields an underestimation of the hazard, and generates a less conservative cleanup goal. However, this process is

preferred to the alternative of not including inhalation exposures in the development of cleanup goals which effectively assumes an inhalation RfD of 0.

vi. Inclusion of air pathway for each COC.

vii. PEF of 1x106 m3/kg was employed for construction workers. This incorporates the recommended concentration of respirable dust in air of 1.0 mg/m3 based on assuming nuisance particulates are present at the ACGIH TWA TVL concentration of 10 mg/m3 and 10 percent of the mass of particles are in the respirable PM 10 range.

viii. Cyanide air intake rate (IRair) was changed from 0.42 m3/day to 20 m3/day for Outdoor Workers and construction workers as Short Term Workers.

ix. Dermal absorption for each COC and inclusion of dermal pathway for each COC.

x. Adults in Recreationalist I and II scenarios were assumed to have a sediment dermal adherence factor (DAF) of 3.0 mg/kg.

xi. Recreationalist II child is assumed to be 6 to 12 years of age, therefore beyond the age of pica ingestion. Thus the soil ingestion was changed from 200 mg/day to 100 mg/day.

EPA's Response. EPA acknowledges there may be differences in some of the details to our approach to risk assessment in comparison to the approach preferred by DTSC. EPA would like to state for the record that we have been working extensively with DTSC since July 2003 in an attempt to resolve any remaining issues with respect to the exposure scenarios, as well as the calculations used to develop cleanup goals. To EPA's recollection, none of the issues raised by DTSC in their above set of comments were raised during the development of the risk assessment or Feasibility Study. Having reviewed these new issues, EPA does not believe they affect the outcome, namely EPA's determination that the Lava Cap Mine Superfund Site poses an unacceptable risk to human health and the environment. Nor do they ultimately affect the selected cleanup goals, as the cleanup goals are driven by background concentrations of site-related contaminants. Therefore, EPA intends to rely on comparisons of the confirmation soil sample results to the reference area data sets for determining when cleanup is complete, rather than on comparison to a single background level of risk-based cleanup goal. EPA will continue to work with DTSC to develop the specifics of this approach.

Proposed Plan Comment No. 12. *Surface water from the mine area was not evaluated in the human health risk assessment and human health risk-based cleanup goals were not developed in the feasibility study for surface water in this area. DTSC calculates the background arsenic concentration in surface water (unfiltered) at 1.8 ug/l (95th percentile). DTSC supports EPA's preliminary remediation goal of the federal Maximum Contaminant Level (MCL) for arsenic (10 ug/l) provided the technical and economical considerations for treating surface water to background and/or risk-based cleanup goal is evaluated more thoroughly in the Record of Decision and remedial action plans.*

EPA's Response. See the response to RWQCB Comment No. 3 for a general discussion of the technical considerations and potential cost impacts associated with treating surface water to background levels of arsenic.

Proposed Plan Comment No. 13. *Nonresidential cleanup goals selected will require institutional controls.*

EPA's Response. EPA concurs with DTSC's comment.

FS Comment No. 14. *FS Page 1-18. DTSC does not agree that the Human Health Risk Assessment identified arsenic as the only significant risk driver. Although DTSC agrees that arsenic is the major risk driver, several other metals (aluminum, antimony, chromium (as Cr+6), iron, lead, manganese, and nickel) were present at the Lava Cap Mine Site in concentrations representing predicted significant risks to humans; that is in concentrations corresponding to potential risks greater than 1 x 10-6 or hazards greater than 1.0. Lead was present in mine source areas at concentrations up to 2320 mg/kg.*

EPA's Response. EPA concurs with DTSC that arsenic is the major risk driver. EPA concurs with DTSC that other metals must be taken into consideration, and other metals, including those listed by DTSC, will be measured in addition to arsenic in determining when the cleanup is complete.

FS Comment No. 15. *FS, Page 1-19. Background arsenic concentrations are reported as 20 mg/kg soil, 25 mg/kg sediment. DTSC does not agree with the use of these values as discussed in comments 7 and 9 above.*

EPA's Response. See the detailed response to DTSC Comment No. 7 regarding calculation of background concentrations. EPA believes that the background concentrations presented in the FS (20 mg/kg for surface soil and 25 mg/kg for sediment) are accurate and appropriate representations of background for the Lava Cap Mine area. .

FS Comment No. 16. *FS, Page 1-25. Surface water sources at the mine area are reported to have concentrations of arsenic up to 14,300ug/l. Four surface water sources were discussed, ponded water from sumps in historical buildings, the collapsed adit discharge, the waste rock/tailings pile seep, and the tailings pile underflow that discharges from the base of the log dam. Surface water from the mine area was not evaluated in the human health risk assessment and human health risk-based cleanup goals were not developed for surface water or sediment in this area.*

EPA's Response. The selected remedy addresses all four of the surface water sources listed in the DTSC comment. Contaminated water present in the sumps in the historic mine buildings will be removed as part of the mine building remediation efforts. The adit discharge and tailings pile discharge from the base of the log dam will be collected and treated. The waste rock/tailings pile seep will be eliminated as part of the surface water controls and tailings pile cap to be installed as part of the mine area remedy.

FS Comment No. 17. *FS, Page 1-31, 1-32. DTSC recommends all references to "mine worker" that actually refer to an outdoor worker be amended accordingly on pages 1-31 & 1-32.*

EPA's Response. In the Human Health Risk Assessment included in the Public Release Draft Remedial Investigation (EPA, 2001) and summarized in the Feasibility Study, the potentially exposed receptor working at the site was referred to as a mine worker. However, in the development of cleanup goals, this potential receptor is referred to as an outdoor worker to clarify that it is not assumed to be someone working inside of the mine, but someone working in the source areas at the mine.

FS Comment No. 18. *FS, Pages 1-33, 1-34, and Appendix F. The results from the human health risk assessment presented and discussed on pages 1-33 and 1-34 are not consistent with those presented in the HHRA (Appendix E of Draft RI, November 2001). The site related risks and hazards appear to be from the revised summary tables included in the Responses to Comments (EPA, August 22, 2002), however the background risks and hazards are not. The background risks and hazards appear to be from the segregated background data sets for Reference Areas 1, 2, and 3, each containing few data points. Appendix F of the FS, however, contains the comprehensive background data set obtained by combining data from Reference Areas 1, 2, and 3 as previously agreed to create a more robust background data set. DTSC recommends correcting this inconsistency within the FS and include the source of all the risk estimates discussed in the text and the means by which they were derived, using an appendix if necessary to achieve transparency in their derivation.*

EPA's Response. The Feasibility Study summarizes specific excess lifetime cancer risk (ELCR) and hazard index estimates for exposure to contaminants in sediment, soil, and surface water for the exposure units addressed in the Feasibility Study. Because groundwater will be addressed in a separate detailed investigation and new groundwater risks will be estimated, the risks specific to ingestion of well water or dermal contact with well water at the residences were not included in the Feasibility Study summary. This is the reason there is a discrepancy between the values presented in the Remedial Investigation Report (EPA, 2001) and the values presented in the Feasibility Study (EPA, 2004). It should be noted that the Feasibility Study does state that risk estimates for exposure to contaminants in groundwater have been determined to be unacceptable for certain exposure scenarios.

The following summarizes the differences between the risk estimates presented in the RI Report and those presented in the FS for Exposure Unit 3, Resident at the Mine. The FS reports the estimated ELCR for the residential receptor as 4.5×10^{-3}, and the hazard index as 84 for the incidental ingestion of soil pathway, with arsenic being the risk driver. These match the values presented for soil/sediment in Table 8-1 of Appendix E of the RI Report. Table 8-1 of RI Report Appendix E also reports the risks associated with ingestion and dermal contact with well water as an ELCR of 1.3×10^{-3} and a hazard index of 7, resulting in the total ELCR of 5.8×10^{-3} and total hazard index of 91.

The background risks and hazards reported in Section 1.6.1 were also taken straight from the Human Health Risk Assessment presented in Appendix E of the RI Report (EPA, 2001). DTSC is correct in noting that these background risks make use of the segregated background data sets for Reference Areas 1, 2, and 3. This is because the Human Health Risk Assessment was completed in 2001, before the decision was made to combine the reference area data sets to create larger more robust data sets. The combined data sets were used in the FS for estimating background concentrations at the site.

FS Comment No. 19. *FS, Page 1-34. The human health risk assessment results for Exposure Unit 4 only addresses the recreational user. DTSC recommends indicating if residents live along Little Clipper Creek.*

EPA's Response. As is described in the Human Health Risk Assessment (included as Appendix E of the RI Report), residents do live along the Little Clipper Creek drainage. However, all of the homes are located well above creek and away from the contamination. The recreational user included in the risk estimates is assumed to be a local resident using the creek area for recreational activities.

FS Comment No. 20. *FS, Pages 1-34, 2-5 to 2-9. Based on DTSC's evaluation of the risks, consistent with DTSC guidance, not only are arsenic, iron, and lead present in soil or sediments at levels of human*

health concern, but also aluminum, antimony, chromium (as Cr^{+6}), manganese, and nickel. DTSC recommends including this information in the FS.

EPA's Response. EPA is planning to conduct post-cleanup confirmation sampling for a full suite of metals. These data will be compared to reference or background data sets to evaluate when cleanup is complete. EPA does not believe it is necessary to revise the FS to acknowledge that DTSC's risk evaluation results in additional metals being present at levels of human health concern. All of the compounds listed by DTSC were included in the evaluation of background concentrations presented in Appendix F of the FS.

FS Comment No. 21. *FS, Page 1-36. Based on DTSC's evaluation wherein unfiltered surface water concentrations were compared to U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for tap water, not only arsenic but also mercury as methyl mercury may be present in surface water in LCC at levels of human health concern. Consequently, HERD developed human health risk-based clean up goals for recreational users exposed via wading in LCC.*

EPA's Response. EPA respectfully disagrees with DTSC's proposal to use the Region 9 tap water PRG to determine the need for cleanup goals for wading in Little Clipper Creek. Also, there appears to be an error in DTSC's comparisons of mercury concentrations. The maximum concentration of mercury detected in Little Clipper Creek below the mine during the RI was 11 ng/L. This is almost 3 orders of magnitude below the EPA Region 9 tap water PRG of 3.6 µg/L.

FS Comment No. 22. *FS, Table 2-1. DTSC recommends including all constituents detected in surface water in the Water Quality Control Plan (Basin Plan) and the corresponding CTR/MCL criteria instead of listing only those which exceed the criteria.*

EPA's Response. FS Table 2-1 presents water quality criteria for constituents that were detected in mine area sample locations (adit discharge (3A), seasonal tailings pile seep (3B), secondary tailings pile seep (3C), log dam seep (4A), and the ponded portion of Little Clipper Creek north of tailings pile (4D)) at concentrations exceeding MCLs or CTR criteria. The comparison was conducted using surface-water monitoring data collected between October 1999 and August 2002. The intent of Table 2-1 was to provide potential chemical-specific ARARs for contaminants of concern (COCs) that have historically exceeded water quality objectives. EPA does not believe that it is necessary to revise the FS to present potential ARARs for contaminants that did not exceed water quality objectives. More detail surrounding the selection of constituents to be included on Table 2001 has been provided to DTSC previously.

FS Comment No. 23. *FS, Page 2-6, Section 2.3.2. Although the residential scenario is the most conservative scenario for carcinogenic effects, the short-term soil invasive construction worker is the most conservative scenario for many non-carcinogenic effects.*

EPA's Response. EPA agrees with DTSC's observation.

FS Comment No. 24. *FS, Table 2-2. Arsenic is not the only carcinogen; cadmium, nickel, and chromium in the hexavalent form are also carcinogens. In addition, DTSC does not agree with the background values presented as discussed in an earlier comment and supported by calculations in the attached tables.*

EPA's Response. EPA agrees with DTSC's observation regarding carcinogens. EPA acknowledges but disagrees with, as covered in some detail in the responses above, to DTSC's proposed approach to calculating background levels.

FS Comment No. 25. *FS, Page 2-8. DTSC recommends confirmation sampling consist of all constituents present in any medium at levels of human health concern. Comparison of confirmation soil and sediment samples with the reference data set (background) envisions the use of the t-test (parametric) or Wilcoxon Rank Sum test (nonparametric). In addition to those tests, DTSC would like EPA to consider the use of the Quantile test which is used to detect when a removal has failed in only a few areas within a cleanup unit and a hot measurement analysis which is used in conjunction with other tests to determine if any contaminant has exceeded its respective upper limit concentration value and, if so, further evaluate if additional local remedial action may be required.*

EPA's Response. EPA will work with DTSC during the remedial design phase to develop details of the confirmation sampling program to be implemented and what tests will be used to compare the confirmation samples with the background or reference data sets.

FS Comment No. 26. *FS, Page 2-9 & 4-35. Both locations state that small isolated areas of tailings along LCC are not proposed for remediation. DTSC recommends remediation of all areas where contaminants are in excess of cleanup goals.*

EPA's Response. EPA's goal will be to remediate all contaminated areas of the Little Clipper Creek channel to the extent practicable. Although, it is anticipated that trace amounts of contamination will likely remain in portions of the stream, any remaining contaminants should not represent a substantial threat to human health or the environment.

FS Comment No. 27. *FS, Appendix F. Recommend revisions to Appendix F to allow for a comprehensive, consistent, stand alone development of background concentrations so that any independent reviewer can reach the same conclusions regarding Lava Cap Mine background concentrations as follows:*

EPA's Response. EPA does not concur with DTSC's recommendation regarding the need to revise Appendix F. EPA will work with DTSC prior to remedy implementation to develop the process to be used to determine when the cleanup is complete.

FS Comment No. 27a. *Including the complete background data set. Include results from statistical population distribution analyses for each chemical in each medium.*

EPA's Response. Basic statistical summaries of the background data, including number of samples, number of detects, mean, standard deviation, minimum detect, maximum detect, location of maximum detect, 95th UCL of Mean, and 95th percentile for each medium are presented in Tables F-1 through F-5 of Appendix F.

FS Comment No. 27b. *Specify the sample locations, depths and analytical results that were deemed unrepresentative of background concentrations and the statistical support or reason for exclusion. There appears to be some confusion on the data excluded.*

EPA's Response. A total of three samples were excluded from the background data sets because they were not considered to be representative of ambient conditions.

One sample was excluded from the background unfiltered groundwater data set. This is the unfiltered groundwater sample collected from Monitoring Well 1B during the RI investigation in November 1999. The arsenic concentration in this sample was 55 µg/L. This sample was excluded because of excessive turbidity. The aluminum concentration in this sample was 229 mg/L, which is over 50 times higher than any other sample collected during the RI field effort. Aluminum is typically a good indicator of the presence of suspended solids in a sample.

Two samples were excluded from the background surface soil data set. The samples were collected from Locations 1B and 1F during the RI investigation in October and November 1999. Arsenic was detected at concentrations of 95.3 mg/kg and 58.7 mg/kg in the surface soil samples 1B and 1F, respectively. Surface soil samples were collected as discrete grab samples between the soil surface to 6 inches below ground surface. The locations are along mine area roads, and given that the arsenic concentrations are so much greater at these locations than other surface soil sample locations in Reference Area 1, the locations are thought to have been affected by soil transport on vehicles traveling to and from the Lava Cap Mine.

FS Comment No. 27b(i). *The text states that two surface soil samples were excluded from the background data set; Table F-1 contains data from 18 surface soil samples; and Table F-2 contains data from 10 subsurface soil samples; Table F-3 contains data from 13 sediment locations. Thus the background data account for 43 soil/sediment locations. In contrast, Tables 3-1 and 3-6 of the Draft RI report contain soil/sediment data for 31 samples, 19 and 12 samples, respectively, for soil/sediment in Reference Areas 1 and 2.*

EPA's Response. Two differences exist between Table 3-1 in the RI and Tables F-1, F-2, and F-3 in Appendix F of the FS. First, Table 3-1 only includes environmental samples, whereas field duplicate samples are included in the total number of samples in Tables F-1, F-2, and F-3. Second, the sample collected from Reference Area 3 at location 20 is documented as a sediment sample in the RI but is entered as a surface soil sample in the database. Therefore, Table 3-1 contains one sediment sample in Reference Area 3, while Appendix F includes this sample in the surface soil statistics. Arsenic was detected at a concentration of 10.1 mg/kg in this sample.

FS Comment No. 27b(ii). *Similarly, the text states that one groundwater sample was excluded from the background data set and Table F-5b contains unfiltered groundwater data from 3 to 11 locations, depending on the analyte. Table 3-4 of the Draft FI report contains groundwater data from only one sample.*

EPA's Response. The background data set used in the FS contains data from one in-situ filtered groundwater sample collected from soil boring 1A and one filtered and three unfiltered groundwater samples collected from Monitoring Well 1B during three sampling rounds (November 1999 and January and May 2000) as part of the RI field program. This is consistent with the text on page 3-14 of the RI and statistics in Table 4-4. Data from the unfiltered groundwater sample collected from Well 1B in November 1999 are not included in the statistics in Table 4-4 of the RI. An additional 6 filtered groundwater samples and 7 unfiltered groundwater samples were collected from Monitoring Well 1B over 7 sampling rounds between September 2000 and November 2002. These data are included in the statistical summary in Table F-5 in Appendix F of the FS. These samples were collected as part of the quarterly monitoring program, and the data have been presented in periodic Field Monitoring Reports.

FS Comment No. 27b(iii). *Likewise, unfiltered background surface water data are presented in Table F-4b for 17 to 27 samples, depending on the analyte, whereas Tables 3-3 and 3-5 of the Draft RI report contain background surface water data from 2 to 15 samples, depending on the analyte, 1 to 6 and 1 to 9 samples, respectively from Reference areas 1 and 2.*

EPA's Response. The background data set used in the FS contains data from three sample locations in Reference Area 1, five sample locations in Reference Area 2, and one sample location in Reference Area 3 collected over three sampling rounds (October 1999 and January and May 2000) as part of the RI field program. For arsenic, a total of 16 environmental samples and 1 field duplicate sample were collected as part of the RI field program; 6 samples were collected from Reference Area 1, 10 samples from Reference Area 2, and 1 sample from Reference Area 3. All samples were unfiltered. This is consistent with sample numbers presented in the RI Report Table 4-3 for Reference Area 1, Table 4-8 for Reference Area 2, and p. 4-26 for Reference Area 3.

An additional seven filtered surface water samples and seven unfiltered surface water samples were collected for arsenic analysis over five sampling rounds between August 2001 and August 2002. These data are included in the statistical summary in Table F-5 in Appendix F of the FS. These samples were collected as part of the quarterly monitoring program, and the data have been presented in periodic Field Monitoring Reports.

FS Comment No. 27b (iv). *The concentration of arsenic in "background" groundwater (Table F-5b) is greater than the MCL of 10 ug/l, creating suspicion with respect to the adequacy of the background sample locations.*

EPA's Response. The presence of naturally-occurring arsenic is common in aquifers throughout the western United States. A large percentage of the background groundwater samples have been collected from Monitoring Well 1B, which is installed far upgradient from the mine and completed in the Volcanic Breccia (the "lava") formation. This formation is not present from the mine southward. All domestic wells in the study area are completed in the Metasedimentary Rock (Pms) formation. As discussed in the RI, the degree of hydraulic communication between the Tvb and Pms formations is not well established. Thus, the data from Monitoring Well 1B may not be truly representative of background concentrations for all residential wells in the Site vicinity.

Also note that additional groundwater background data will be collected as part of the separate groundwater RI efforts that are underway and the development of groundwater background concentrations will be further assessed.

FS Comment No. 27c. *Refer or include the map(s) identifying the locations for each background sample.*

EPA's Response. Maps showing the locations for each background sample are included in the RI Report as Figures 3-1, 3-2, 3-3, and 3-4 (all sample points starting with 1, 2, or 20). The background evaluation included additional surface water and groundwater samples collected through November 2002 as part of the quarterly monitoring program; however, no new sample locations were added during this period.

FS Comment No. 28. *FS, Appendix G. Recommend revision of Appendix G to provide a more comprehensive, stand-alone development of human health risk-based cleanup goals to allow any independent reviewer to reproduce the calculations. Transparency in the development of risk-based*

cleanup goals for the public record necessitate inclusion of the following: standard equations employed, spreadsheet outputs from DTSC's Blood Lead version 7.0, as well as citing sources used for each exposure factor and toxicity criterion. Included with these comments are attached spreadsheets applying DTSC recommended assumptions and generated proposed CUGs for soil, sediment and surface water for the mine OU consistent with DTSC guidance.

EPA's Response. EPA does not concur with DTSC's recommendation regarding the need to revise Appendix G. Again, EPA acknowledges there may be differences in some of the details to our approach to risk assessment in comparison to the approach preferred by DTSC. EPA's risk assessment for the Site complies with EPA guidance, is defensible, and supports EPA's conclusion that the Site represents an unacceptable risk to human health and the environment, a conclusion with which DTSC has not expressed any disagreement. As has been noted in numerous previous response, EPA will work with DTSC prior to remedy implementation to develop the process to be used to determine when the cleanup is complete. EPA does not intend to rely heavily on individual risk-based cleanup goals in determining when the soil and sediment remediation efforts are complete.